SL Acid Base Review MS (2011 Exam)

1. D(6)
2. C(4)
3. D(4)
4. D(5)
5. B(4)
6. D(5)
7. C(4)
8. B(5)
9. B(5)
10. B(5)
11. D(5)
12. D(5)
13. B(5)
14. D(6)
15. D(4)
16. A(5)
17. D(5)
18. A(5)
19. D(5)

Legend		Free Response Section (Paper 02)												
Level:	Needed	Grade	Possible	3		4		5		6		7		Cutoff
Above +6	0%	**2**	0	70%	0	50%	0.5	30%	4.8	20%	1.2	10%	0.6	**7**
Above +5	10%	**3**	0	80%	0	70%	0.7	50%	8	30%	1.8	20%	1.2	**12**
Above +4	20%	**4**	1	90%	0	80%	0.8	70%	11.2	50%	3	30%	1.8	**17**
Above +3	30%	**5**	16	100%	0	90%	0.9	80%	12.8	70%	4.2	50%	3	**21**
Above +2	50%	**6**	6	100%	0	100%	1	90%	14.4	80%	4.8	70%	4.2	**24**
Above +1	70%	**7**	6	100%	0	100%	1	100%	16	90%	5.4	80%	4.8	**27**
Level	**80%**	**Multiple Choice Section (Paper 01)**												
Below -1	90%	Grade	Possible	3		4		5		6		7		Cutoff
Below -2	100%	**2**	0	70%	0	50%	2.5	30%	3.3	20%	0.6	10%	0	**6**
Below -3	100%	**3**	0	80%	0	70%	3.5	50%	5.5	30%	0.9	20%	0	**10**
Below -4	100%	**4**	5	90%	0	80%	4	70%	7.7	50%	1.5	30%	0	**13**
Below -5	100%	**5**	11	100%	0	90%	4.5	80%	8.8	70%	2.1	50%	0	**15**
Below -6	100%	**6**	3	100%	0	100%	5	90%	9.9	80%	2.4	70%	0	**17**
Below -7	100%	**7**	0	100%	0	100%	5	100%	11	90%	2.7	80%	0	**19**

20. *Brønsted-Lowry acid:*

(5x1)a proton donor;

Lewis acid:

(5x1)electron <u>pair</u> acceptor;

Brønsted-Lowry acid Equation:

(5x1)Any suitable equation;

Lewis acid Equation:

(6x2)BF_3/$AlCl_3$/transition metal ions that form complex ion with ligands;

For example

$BF_3 + NH_3 \rightarrow BF_3NH_3$ / $Cu^{2+} + 4NH_3 \rightarrow [Cu(NH_3)_4]^{2+}$ / $AlCl_3 + Cl^- \rightarrow AlCl_4^-$; 5

Or any suitable equation.

[5]

21. (a) (5x1)an acid that partially dissociates/ionizes/doesn't fully dissociate/ionize; 1

(b) (5x2)Any two of the following:

*conductivity - propanoic acid will be lower because lower ion concentration/less dissociated;

*reaction with metal/metal carbonate/metal hydrogencarbonate - propanoic acid will react slower/less vigorously because lower $[H^+]$/less dissociated;

*reaction with alkali - temperature change will be less for propanoic acid because lower $[H^+]$/less dissociated; 2

*Award **[1]** mark each for two.*

[3]

22. (i) (6x1)bubbling/effervescence/dissolving of $CaCO_3$/gas given off (*do not accept* CO_2 *produced*);

(5x1)more vigorous reaction with HCl/*OWTTE*; 2

(ii) (5x1 Eqn)

(6x1 Bal) $2HCl(aq) + CaCO_3(s) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(1)$; 2

***[1]** for correct formulas, **[1]** for balanced, state symbols not essential.*

(iii) (4x1)amount of $CaCO_3 = \frac{1.25}{100.09}$ (*no penalty for use of 100*);

(5x1)amount of HCl = 2×0.0125 = 0.0250 mol (*allow ECF*);

(6x1)volume of HCl = 0.0167 dm^3/16.7 cm^3 (*allow ECF*); 3

(iv) (5x1)1:1 ratio of $CaCO_3$ to CO_2 /use 0.0125 moles CO_2 (*allow ECF*);

(5x1) (0.0125×22.4) = 0.28 dm^3/280 cm^3/2.8×10^{-4} m^3 (*allow ECF*); 2

Accept calculation using pV=nRT.

[9]

23. (5x1)vinegar and factor of 10^5;

[1]

24. (i) (5x2) Any two of the following:
*HCl/X is strong and CH_3COOH/Z is weak;
*HCl/X is fully dissociated and CH_3COOH is slightly dissociated;
*$[H^+]$ is greater in HCl/X than in CH_3COOH/Z; 2
*Any two for **[1]** each.*

(ii) (5x1) a factor of 100; 1

[3]

25. (i) (6x1) $CH_3CH(OH)COOH + H_2O \rightleftharpoons CH_3CH(OH)COO^- + H_3O^+$; 1
Ignore state symbols even if incorrect.
The double arrow is necessary for the mark.

(ii) (7x1) $k_a = \frac{[CH_3CH(OH)COO^-][H^+}{[CH_3CH(OH)COOH]}$; 1
Allow $[H_3O^+]$ for $[H^+]$ in the expression.
.

[2]

26. (7x2)resists change in pH;
when **small** amounts of strong acid or base added to it; 2

[2]

27. (a) (5x1) (K_W =)$[H^+][OH^-]$; 1

(b) (7x3) $[H^+] = \sqrt{K_W} / \sqrt{5.60 \times 10^{-14}}$;
= 2.37×10^{-7} (mol dm^{-3}) 3
(accept 2.3 – 2.4×10^{-7}*, no significant figure penalty);*
pH = 6.6 *(accept* 6.60 – 6.63*, no significant figure penalty);*

[4]